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Comments on the Non-Groundwater Portions of the Revised Draft Remedial Investigation Report Prepared by Geo-Hydro Inc. on behalf of People in Need of Environmental Safety

Geo-Hydro Inc. (GHI), on behalf of People In Need of Environmental Safety (PINES), is submitting the following comments on the portions of the Revised Draft Remedial Investigation Report (RI) on the Pines Area of Investigation, dated December 5, 2008, that pertain to media other than groundwater. GHI is currently evaluating the groundwater model supplied by the Respondents. Results of this evaluation will be incorporated into a separate set of comments covering groundwater-related issues.

Specific Comments

1) Page 2-11, Section 2.4 – In their response to EPA comments on the revised draft Remedial Investigation Report (Appendix BB), the respondents effectively ignored this comment by saying that the data was collected outside of the RI and therefore cannot be included in the RI. This in spite of the fact that the respondents include many pages of discussion and data from non-RI sources when it suits their purpose. The respondents must not be allowed to use outside information when it supports their desired interpretation while selectively ignoring information that contradicts their preconceived notions. The original comment is reiterated below.

   "Samples of surface soil from the Islamic Center and the Kysel residence, outside of the Area of Concern and upgradient and upstream of Yard 520, were collected by PINES members and sent to Dr. Maria Mastalerz at Indiana University for microscopic examination. Dr. Mastalerz's examination indicated (Attachment 2) that the samples contain varying percentages (1 to 20%) of CCBs. This finding demonstrates: 1) that the locations of suspected CCBs identified in the draft RI by no means represent the entire distribution of CCBs in and around the area of investigation, 2) that mixtures of CCB and soil, not merely end member compositions, are present in the area, and 3) that "background" soil and groundwater samples are potentially impacted by CCB deposits that have not been identified through visual inspections of the surface materials. These findings cast doubt on identifications of all background soil and water sampling locations that are based on the lack of visually identifiable CCBs."

   The areas surrounding background soil and water sampling locations must be surveyed to identify CCBs that have been disposed in the vicinity of upstream or background sample locations. Microscopic examination or other techniques can be used to distinguish CCBs, or mixtures of soil and CCBs, from natural soils.

2) Page 2-12, Section 2.6 - The first paragraph of this section states that, "background surface soil samples were collected from locations believed to not contain suspected CCB's to determine site-specific background conditions." The ability to distinguish between soil and CCB is predicated on the validity of a simple visual examination. The draft RI report does not describe the criteria of that visual examination or any independent test(s) that verified the validity and adequacy of the visual protocol. Further, the ability of field personnel to distinguish soil impacted from CCBs through

visual methods is even more dubious now that it has been established (see previous comment) that CCB and soils exist as mixtures in varying percentages. By what reliable, objective criteria is it 'believed" that the selected background locations do not "contain suspected CCB's" or, equally important, not include CCB impacts? Background sample locations must be screened (by microscopy or other means) for the potential presence of CCBs in order to distinguish impacted locations from locations that are characteristic of background.

3) Page 2-13, Section 2.6 - The background soil data set includes data from both organic-rich wetland soils and granular upland soils. It is well established that organic-rich wetland soils collect and accumulate metals that migrate through the lowlands along surface water and/or groundwater flow paths. Therefore the organic-rich wetland soils do not represent background conditions for sandy upland soils. Plots of the purportedly background soil data set clearly show anomalously high values for several metals in wetland soils that are not characteristic of sandy upland soils. At a minimum the background soil data set must be divided into sandy upland soils and organic wetland soils in order to facilitate meaningful comparisons with background. Additionally, both data sets must be tested for the presence of data outliers to identify samples that have been impacted by the presence of yet to be identified CCBs, as well as examined by microscope, x-ray diffraction, or other non-visual technique to verify their status as truly background samples.

4) Page 2-32, Section 2.17 – The information submitted by the respondents purportedly to investigate subsurface soils for accumulation of arsenic does not remotely answer the question. It would have been truly miraculous if the respondents had identified the geochemical zone where arsenic is being removed from the groundwater by collecting one soil sample near each of five different CCB disposal areas; especially since the boring logs provided in Appendix E show that only one of the samples was collected below the water table. Unfortunately it will take more than one single appropriately located sample to locate the arsenic. The discussion of arsenic migration presented by the Respondents on page 5-7 rightly indicates that, "Based of the groundwater data in the vicinity of Yard 520, attenuation processes appear to be very effective in removing As from groundwater". We agree that the processes of sorption and/or co-precipitation identified by the respondents are important mechanisms in removing arsenic from groundwater. However, the unanswered question remains. Where is the arsenic that is being removed from the groundwater, how concentrated is it now, and how concentrated will it eventually become? The data shows that groundwater migrating laterally away from Yard 520 encounters REDOX conditions and/or sorptive materials that remove arsenic from solution. The arsenic is not destroyed, it does not evaporate; <u>it is accumulating in the soil</u>. Arsenic is increasing in soil at some location or over some distance between Yard 520 and downgradient wells as it is removed from the water. This same process is likely to be occurring downgradient of other sizeable flyash deposits outside of Yard 520. Sampling of clay at the base of the shallow aquifer along the edge of Yard 520 does not address the question of where and by how much is arsenic accumulating in soils between the disposal cell and downgradient wells. Subsurface soil samples need to be collected within the path(s) of migration at intervals between Yard 520 and downgradient wells to attempt to locate the arsenic that is being removed from groundwater and accumulating in the subsurface soils.

5) Page 3-6 Section 3.4.2, – The discussion of the construction of the North and South Areas at Yard 520 indicates that the North Area was capped with a "vegetated clayey soil cover". No mention is made of the cover applied to the South Area. Water level data collected from PZ001 as part of the RI shows that precipitation is penetrating the cover, resulting in high hydraulic head in North Yard

520. Assuming that the soil cover on the South Area is similar to that on the North Area, we should expect that head within the South Area will be at least as high, and perhaps higher, since flow out the sides and bottom should be slowed relative to flow from the North cell by the presence of the 3-foot clay side-walls and the removal of the underlying aquifer. Since PZ001 is the only data point within either of the disposal areas, leachate elevation in both the North and South Areas should reflect the development of a mound consistent with PZ001. Please show leachate levels in both the north and South Areas consistent with highest measured elevation of leachate at PZ001 or install piezometers in both cells to obtain actual current head data in Yard 520.

6) Page 3-7, Section 3.4.2, last bullet – The assumption that the South Area of Yard 520 has no interaction with the surrounding aquifer is hydrologically unrealistic and is based on no empirical data. Installation and continuous monitoring of piezometers inside and outside of Yard 520 would be necessary to demonstrate lack of a hydraulic connection. Recall that the respondents argued in the Site Management Strategy document that groundwater flows upward through the thick clay confining unit in sufficient volume to contaminate the surficial aquifer. They now argue in the RI that the same underlying confining layer does not recharge into south Yard 520 and a 3-foot thick clay wall completely isolates the landfill cell from the groundwater flow system. The hydraulic properties of this 3-ft wall are no different that those postulated for CCBs in north Yard 520 and, by extension, in south Yard 520. Water will move as easily through the soil cover above the ash withinsouth Yard 520 as it does in north Yard 520 and the lateral clay barriers are essentially equivalent to what is postulated for the CCBs. We agree that the clay walls may initially slow migration, but experience shows that clay liners and walls do leak. Completely removing the south cell from the shallow system is neither accurate nor appropriate, and may be one of the causes of groundwater modeling problems being encountered. Please include a reasonable approximation of hydrogeologic conditions within and surrounding South Yard 520.

7) Page 3-8, Section 3.4.3, first full paragraph – The discussion of groundwater levels acknowledges but fails to address the concern that bringing in municipal water supply to Pines has had the unanticipated effect of increasing groundwater levels to the point that wet and flooded basements result. The discussion in this paragraph states that there is no indication that water levels are <u>currently</u> rising. Whether or not water levels continue to rise is not the issue. The people of Pines have asked for an unbiased evaluation of whether provision of public water without public sewer service may have caused an increase in the water table in the immediate vicinity of their homes. Neither the information provided in this section nor the methodology used in the groundwater model report (Appendix L) appropriately addresses this question. In the real world, increased recharge resulting from the provision of municipal water occurs at discrete locations within a few yards of individual homes. Uniformly reducing recharge to the entire water service area (as was discussed in Appendix L, Section 5.1) does not address local mounding at individual homes that could result from the local addition of municipal water to the flow system. The expressed concerns of the citizens of Town of Pines must be honestly addressed.

8) Page 4-3, Section 4.2 - The background soil data set discussed in the revised draft RI includes samples collected during the water line installation project. As discussed in the RI Report and in Appendix L, that CCB is interpreted as being bottom ash. Since CCBs are present in varying percentages along roads throughout the area and fly ash use as fill is described throughout the town, the problem is not simply to distinguish between pure CCB bottom ash and pure soil; it is to determine which samples contain some amount of CCB. Further, it is impossible to visually

determine which samples are unimpacted soils even among samples solely of soil, because samples without CCB may still be impacted by proximal CCB. The data must either be statistically evaluated using rigorous techniques to identify and remove CCB impacted samples from the background data set, or all samples collected along the roadways must be eliminated from the data set. Failure to adequately screen the background data set for CCB impacts will result in unnaturally elevated background values and compromise the integrity of subsequent evaluations.

9) Page 4-3, Section 4.2.1 – The evaluation of background soil inappropriately mixes different soil types (granular soil and organic soil). Organic soils located in low-lying wetland areas are distinctly different and will have a distinctly different chemical composition than granular dune sands. Comparison of granular soils consisting primarily of dune sands from neighborhoods and back yards against a background data set that also includes organic wetland soils is inappropriate and misleading. Inappropriately including multiple soil types into a single background population results in data set statistics that are overly broad and are not descriptive of any soil type. Background needs to be established for each of soil types in order to allow accurate comparisons against background for that soil type. Please establish separate background ranges for organic and granular soil types.

10) Page 4-5, Section 4.2.3 – The two and one-half pages discussing the background concentration of arsenic in soils across the United States are irrelevant to site-specific risks associated with exposure to the citizens of Pines and are a prime example of how the Respondents feel free to incorporate non-RI data when it suits their purpose, while eliminating other local data that was not collected as part of the RI. The national range of arsenic concentrations could be made somewhat more relevant by adding a discussion of similar detail describing the elevated concentrations of arsenic found in CCBs at various sites across the country, providing data on historic deposition rates of CCB on downwind areas prior to the Clean Air Act, and isolating those values from the nationwide background. But, as interesting as such an assessment might be, it still would have basically nothing to do with the proper implementation of an RI to allow meaningful risk assessments.

11) Page 4-35, Section 4.4.7 – Construction of individual iso-concentration maps for each parameter detected above the screening level, for each sampling event, is a standard method of depicting groundwater analytical data that are missing from this draft RI. In response to our previous comment requesting that these maps be prepared the Respondents prepared one map (Figure 4-34) of boron concentrations. A note on that map indicates that it based on boron concentrations in groundwater and surface water, groundwater hydraulic gradients, the presence of larger areas of CCBs, and information compiled on Figure 4-18. Simple iso-concentration maps of parameters in groundwater depict measured concentrations in monitoring wells. The unquantified and unquantifiable use of other modifying factors like hydraulic gradients and surface water chemistry is at least irregular and potentially highly deceiving. Please prepare standard iso-concentration maps for each parameter detected above screening levels during each sampling event.

12) Page 4-34, Section 4.4.6 – The discussion of concentration trends over time ignores the fact that the starting concentrations in many of the graphed wells appear to be well above background concentrations, likely representing impacts from CCBs in existence at the start of the data set. The scale of the concentration graphs is such that significant changes in concentration appear to the casual observer to be minimal. Contrary to the conclusion of this section, review of the graphs

imbedded in the text of this section shows that well MW-6, located on the northern edge of Yard 520, clearly shows increasing boron concentrations over the period of the record. This observation is consistent with increased head in Yard 520 driving more flow away from the landfill toward the north. Similar graphs should be prepared for all monitoring wells so that those showing increasing or decreasing concentration trends can be identified. The scale of the new graphs should be chosen to allow concentration trends to be identified rather than masking trends in the manner of those presented in the text. Selective use of a subset of the data to make a sweeping statements about the lack of trends in the data is misleading

13) Page 4-35, Section 4.4.7 – All of the conclusions about the nature and extent of CCB-derived constituents in groundwater are suspect pending resolution of numerous outstanding questions about the Respondent's characterization of groundwater flow.

14) Page 4-57, Section 4.6 – The beginning of this section states, "… the chemistry of sediments is similar to that of the soil and geologic materials within the local watershed as sediments are derived primarily from these materials". We agree with this statement, although the authors of the RI appear to miss the full significance of the observation. Since soil samples collected by the PINES citizen's group in areas outside and upstream of the Area of Concern showed various amounts of CCB present in the surface soils upstream of Yard 520, it is not unexpected to find CCB-related metals in upstream sediment. It is incorrect to assume that any samples upstream of Yard 520 are unimpacted by the widely distributed CCB's in the area. An appropriate evaluation of background sediment samples must be conducted to identify and remove CCB impacted sediments from the upstream sediment data set.

15) Page 4-57, Section 4.6.1 – In referring to upstream sediment characteristics the Respondents make the statement that, "Based on their locations, samples from these locations are believed to be unrelated to CCBs." The utility industry has for years promoted their beliefs, including the belief that flyash is an inert material that cannot leach contaminants into the environment or, flyash sets up as an impermeable mass precluding penetration of water. Indeed, on a recent conference call we all again heard the assertion that flyash sets up like a brick so water can't flow through it. Belief is not a tenet of science and beliefs like these have no valid part as a foundation of opinion in an RI Report. In an area like Town of Pines where CCB has been disposed in many locations, both identified and unidentified and some are known to be upstream and upgradient of the Area of Investigation, it is inadequate and inappropriate to depend solely on location as the indicator that a sample is unaffected by CCB's. The upstream sediment data set must be evaluated to identify and eliminate CCB impacted samples from the data, using a methodology that is capable of doing so. The claim that sediment samples are thought to be unimpacted by CCBs based solely on their location is misleading and must be removed.

16) Page 4-59, Section 4.6.1.2 - This section states, "Based on their locations, constituents in upgradient sediments are believed to be unrelated to CCB's." Soil samples collected by the PINES citizen's group in areas outside and upstream of the Area of Concern showed various amounts of CCB present in the surface soils, and it is not unexpected to find CCB-related metals in upstream sediments as defined in the RI. The upstream sediment samples must be evaluated to identify and remove CCB impacted materials from the data set. The claim that sediment samples are not impacted by CCBs based solely on their location is inaccurate and must be removed.

17) Page 4-66, Section 4.6.2.2 – The discussion of total metals concentration, TOC and other supposed issues related to evaluating Brown Ditch sediment analyses appear to be an elaborate smokescreen designed to obfuscate the dramatic increase in CCB-related metals in Brown Ditch adjacent and downstream of Yard 520 and other CCB locations. The concentrations of several metals dramatically increase adjacent to known CCB disposal areas and then slowly decline downstream. The respondents make much of the fact that total metals is generally higher in clay and silt-sized sediment than in sandy sediments, and attribute that to the high aluminum content in some clays. First, concentrations of metals, high or low, are not as relevant as patterns of rising concentrations. Second, a change in grain size however does not account for increases in CCB-related and other metals generally not associated with clays. Further, the discussion ignores the geochemical expectation that CCB-impacted groundwater discharging into the bottom of Brown Ditch encounters chemical and mineralogical conditions that cause the CCB-derived metals to precipitate from solution as, or adsorb onto, fine particles within the bottom sediments. This expectation is consistent with the observed increase in fine-grained sediment, the dramatic increase in metals content adjacent to and downstream of Yard 520, and the gradual decline in concentrations further downstream. The observational data from Brown Ditch are singularly consistent with a baseflow containing CCB-derived metals.